CLAIMS

What is claimed is:

1. An antenna comprising:

a patch radiator;

a printed circuit board disposed adjacent to said patch radiator, said printed circuit board comprising a plurality of stubs, a feed network, and a first ground plane;

a slot disposed within said first ground plane;

a cavity disposed adjacent to said first ground plane; and

a second ground plane disposed adjacent to said cavity, whereby said stubs feed said slots and said slots excite said cavity such that said patch radiator generates RF energy with a wide beamwidth and bandwidth.

2. The antenna of claim 1, wherein said patch radiator comprises a substantially rectangular shape.

3. The antenna of claim 1, wherein said slot has an electrical length that is less than or equal to one half of wavelength.

4. The antenna of claim 1, wherein said slot comprises a dog-bone shape.

5. The antenna of claim 1, wherein said slot establishes a transverse-magnetic mode of RF energy within said cavity.

6. The antenna of claim 1, wherein said cavity comprises one or more flanges that are attached to said first ground plane with a dielectric fastener.

7. The ~~antenna of claim 1,~~ wherein portions of said feed network are aligned with flanges of said cavity such that said flanges conduct heat from said portions of said feed network.

8. The antenna of claim 1, wherein said cavity comprises two or more walls having a predetermined spacing between respective walls while said cavity propagates a transverse magnetic mode of RF energy.

9. The antenna of claim 1, wherein said cavity is fastened to said second ground plane with a dielectric fastener.

10. The antenna of claim 1, wherein said system has a total height of less than or equal to one seventh of a wavelength and a total width of less than or equal to six-tenths of a wavelength.

11. The antenna of claim 1, further comprising a radome, said radome substantially increasing the performance of said antenna.

12. An antenna array comprising:

a plurality of stacked radiating elements, each stacked radiating element comprising a first rectangular patch radiator and a second rectangular patch radiator;

a printed circuit board disposed adjacent to each said first rectangular patch radiator, said printed circuit board comprising a plurality of stubs and a ground plane; said first rectangular patch radiator disposed between said second rectangular patch radiator and said printed circuit board;

a plurality of slots positioned within said ground plane, each slot being aligned with a respective stacked radiating element; and

a plurality of cavities enclosing said ground plane and respective slots whereby said stubs feed said slots and said slots excite respective cavities such that said patch radiators radiate RF energy with increased beamwidth and bandwidth.

13. The antenna array of claim 12, wherein said first patch is spaced apart from said second patch by one or more dielectric spacer elements.

14. The antenna array of claim 12, wherein each of said slots has an electrical length that is less than or equal to one half of wavelength.

15. The antenna array of claim 12, wherein each of said slots comprises a dogbone shape.

16. The antenna array of claim 12, wherein said slots establish a transverse-magnetic mode of RF energy within said cavity.

17. The antenna array of claim 12, where each cavity has two or more walls that form corners, each corner comprising a predetermined spacing to substantially reduce or eliminate passive intermodulation.

18. A method for producing RF radiation patterns with increased beamwidths and RF energy with increased bandwidth within a compact volume, comprising the steps of:

positioning a plurality of slots within a ground plane of a printed circuit board;

propagating RF energy along a feed network;

dissipating heat from the feed network into portions of a metallic cavity;

exciting the slots to establish a mode of RF energy within the metallic cavity; and

exciting patch radiators with the RF energy produced by the slots and the cavity.

19. The method of claim 18, further comprising the step of maintaining a space between corners of the cavity in order to reduce passive intermodulation.

20. The method of claim 18, further comprising the step of shaping the slots such that each slot has an effective electrical length of less than or equal to a half wavelength for efficient RF coupling to or from the feed network and cavity.